What Is Claimed Is:

1. A method for fabricating a filament for use in tissue engineering, said method comprising:

providing a polycaprolactone material;

melting said polycaprolactone material at a first given temperature to form a polycaprolactone melt;

holding the temperature of said polycaprolactone melt at said first given temperature for a given amount of time;

lowering the temperature of said polycaprolactone melt from said first given temperature to a second given temperature after the step of holding the temperature of said polycaprolactone melt at said first given temperature for said given amount of time;

extruding said polycaprolactone melt through a fiber-spinning machine, said fiber-spinning machine having spinnerets with a die exit of a given diameter, a piston set at a given speed, and a vertical drop of a given distance from said die exit to a cooling material positioned below said die exit, wherein the

combination of said second given temperature, said given die exit diameter, said given piston speed, and said given distance of said vertical drop produces said filament with a given diameter for use in tissue engineering.

2. A method for fabricating a filament for use in tissue engineering according to claim 1 wherein said given diameter of said filament corresponds to drive wheels of an unmodified Fused Deposition Modeling (FDM) system.

3. A method for fabricating a filament for use in tissue engineering according to claim 2 wherein said filament is configured to have a constant diameter.

4. A method for fabricating a filament for use in tissue engineering according to claim 1 wherein said filament is vacuum-dried prior to usage.

5. A method for fabricating a filament for use in tissue engineering according to claim 1 wherein said filament is kept in a dessicator prior to usage.

6. A method for fabricating a filament for use in tissue engineering according to claim 1 wherein said filament is vacuum-dried and kept in a dessicator prior to usage.

7. A method for fabricating a filament for use in tissue engineering according to claim 1 wherein said polycaprolactone material as initially provided is in the form of pellets.

8. A method for fabricating a filament for use in tissue engineering according to claim 1 wherein said first given temperature is about 190° C.

9. A method for fabricating a filament for use in tissue engineering according to claim 1 wherein said given amount of time is about 15 minutes.

10. A method for fabricating a filament for use in tissue engineering according to claim 1 wherein said second given temperature is about 140° C.

11. A method for fabricating a filament for use in tissue engineering according to claim 1 wherein said given diameter of said die exit is about 1.63 mm.

12. A method for fabricating a filament for use in tissue engineering according to claim 1 wherein said given speed of said piston is set at about 10 mm/min.

13. A method for fabricating a filament for use in tissue engineering according to claim 1 wherein said given distance of said vertical drop from said die exit to said cooling material is about 40 mm.

14. A method for fabricating a filament for use in tissue engineering according to claim 1 wherein said cooling material is water.

15. A method for fabricating a filament for use in tissue engineering according to claim 1 wherein said given diameter of said filament includes a range of about 1.60 mm to about 1.80 mm.

16. A method for fabricating a filament for use in tissue engineering according to claim 1 wherein said given diameter of said filament is about 1.70 mm.

17. A method for fabricating a filament for use in tissue engineering, said method of fabricating said filament comprising:

providing polycaprolactone pellets;

melting said polycaprolactone pellets at about 190° C to form a polycaprolactone melt;

holding the temperature of said polycaprolactone melt at about 190° C for about 15 minutes;

lowering the temperature of said polycaprolactone melt from said first given temperature to about 140° C after the step of holding the temperature of said polycaprolactone melt at about 190° C for about 15 minutes; and

extruding said polycaprolactone melt through a fiber-spinning machine, said fiber-spinning machine having spinnerets with a die exit of about 1.63 mm, a piston set at about 10 mm/min, and a vertical drop of about 40 mm from said die exit to water positioned below said die exit, wherein the combination of said lower temperature of about 140° C, said die exit diameter of about 1.63, said piston speed of about 10 mm/min, and said vertical drop of about 40 mm produces said filament with a given diameter for use in tissue engineering;

wherein said given diameter of said filament corresponds to drive wheels of an unmodified Fused Deposition Modeling (FDM) system;

wherein said filament is configured to have a constant diameter; and

wherein said filament is vacuum-dried and kept in a dessicator prior to usage.

18. A method for fabricating a filament for use in tissue engineering, said method comprising:

providing a polycaprolactone material;

drying said polycaprolactone material at a first given temperature for a first given amount of time to form a dried polycaprolactone material;

combining said dried polycaprolactone material with a HA and methylene chloride mixture to form a PCL/HA blend;

stirring said PCL/HA blend at a second given temperature for a second given amount of time to form a solvent mixture;

casting said solvent mixture on a tray at a third given temperature for a third given amount of time to evaporate said solvent mixture to form a PCL/HA composite foam material;

melting said PCL/HA composite foam material at a fourth given temperature to form a PCL/HA melt;

holding the temperature of said PCL/HA melt at said fourth given temperature for a fourth given amount of time;

lowering the temperature of said PCL/HA melt from said fourth given temperature to a fifth given temperature after the step of holding the temperature of said PCL/HA melt at said fourth given temperature for said fourth given amount of time; and

extruding said PCL/HA melt through a fiber-spinning machine, said fiber spinning machine having spinnerets with a die exit of a given diameter, a piston set at a given speed, and a vertical drop of a given distance from said die exit to a cooling material positioned below said die exit, wherein the combination of said fifth given temperature, said given die exit diameter, said given piston speed, and said given distance of said vertical drop produces said filament with a given diameter for use in tissue engineering.

19. A method for fabricating a filament for use in tissue engineering according to claim 18 wherein said first given temperature during the step of drying said polycaprolactone material is about 40° C.

20. A method for fabricating a filament for use in tissue engineering according to claim 18 wherein said first given amount of time for drying said polycaprolactone is about 24 hours.

21. A method for fabricating a filament for use in tissue engineering according to claim 18 wherein the step of drying said polycaprolactone material is in a vacuum oven.

22. A method for fabricating a filament for use in tissue engineering according to claim 18 wherein said second given temperature during the step of stirring said PCL/HA blend is about 25° C.

23. A method for fabricating a filament for use in tissue engineering according to claim 18 wherein said second given amount of time during the step of stirring said PCL/HA blend is about 2 hours.

24. A method for fabricating a filament for use in tissue engineering according to claim 18 wherein the step of stirring said PCL/HA blend is on a platform shaker.

25. A method for fabricating a filament for use in tissue engineering according to claim 18 wherein said third given temperature during the step of coating said solvent on said tray is about 25° C.

26. A method for fabricating a filament for use in tissue engineering according to claim 18 wherein said third given amount of time during the step of casting said solvent on said tray is about 24 hours.

27. A method for fabricating a filament for use in tissue engineering according to claim 18 wherein said tray is formed of glass.

28. A method for fabricating a filament for use in tissue engineering according to claim 18 wherein said fourth given temperature during the step of melting said PCL/HA composite foam material is about 150° C.

29. A method for fabricating a filament for use in tissue engineering according to claim 18 wherein said fourth given amount of time during the step of holding the temperature of said PCL/HA melt at said fourth given temperature is about 15 minutes.

30. A method for fabricating a filament for use in tissue engineering according to claim 18 wherein said given diameter of said die exit is about 1.625 mm.

31. A method for fabricating a filament for use in tissue engineering according to claim 18 wherein said given speed of said piston is set at about 1 cm/min.

32. A method for fabricating a filament for use in tissue engineering according to claim 18 wherein said given distance of said vertical drop from said die exit to said cooling material is about 40 mm.

33. A method for fabricating a filament for use in tissue engineering according to claim 18 wherein said cooling material is water.

34. A method for fabricating a filament for use in tissue engineering according to claim 18 wherein said given diameter of said filament includes a range of about 1.65 mm to about 1.85 mm.

35. A method for fabricating a filament for use in tissue engineering according to claim 18 wherein

said given diameter of said filament is about 1.75 mm.

36. A method for fabricating a filament for use in tissue engineering according to claim 18 wherein said filament has a length in the range of about 7.8 m to about 8.2 m.

37. A method for fabricating a filament for use in tissue engineering according to claim 18 wherein said filament has a length of about 8.0 m.

38. A method for fabricating a filament for use in tissue engineering according to claim 18 further comprising the step of storing said PCL/HA composite foam material in a dessicator prior to the step of melting said PCL/HA composite foam material so as to form said filament.

39. A method for fabricating a filament for use in tissue engineering according to claim 18 wherein said PCL/HA blend has a 25% content of HA.

40. Apparatus for use in tissue engineering, said apparatus comprising:

a scaffold structure being formed of a plurality of horizontal layers of material;

vertical walls forming each of said plurality of horizontal layers of material, said walls of each layer of said plurality of horizontal layers each having a height, each being horizontally separated from one another, and defining an orientation;

adjacent pairs of said vertical walls of each of said plurality of horizontal layers of material forming channels therebetween, said channels having a depth and a width created by said height of said walls and said horizontal separation of said adjacent pairs of said vertical walls, respectively;

adjacent layers in said plurality of horizontal layers of material being in different orientations to one another wherein said orientation defined by adjacent ones of said each layer of said walls of said plurality of horizontal layers differ from one

another, said different orientations providing a group of cross-points to allow adhesion between said adjacent layers and providing interconnectivity between said channels throughout said scaffold structure.

41. Apparatus for use in tissue engineering according to claim 40 wherein said material forming said scaffold structure is a polycaprolactone filament.

42. Apparatus for use in tissue engineering according to claim 40 wherein said material forming said scaffold structure is a polycaprolactone/hydroxyapatite composite filament.

43. Apparatus for use in tissue engineering according to claim 40 wherein said vertical walls have a linear shape.

44. Apparatus for use in tissue engineering according to claim 40 wherein said vertical walls have a curved shape.

45. Apparatus for use in tissue engineering according to claim 40 wherein said orientation of said walls is a lay-down pattern of linear shaped walls for progressive layers of said plurality of horizontal layers of material with respect to said lay-down pattern for a first horizontal layer.

46. Apparatus for use in tissue engineering according to claim 45 wherein said orientation of said walls is in a lay-down pattern of 0°/90°.

47. Apparatus for use in tissue engineering according to claim 45 wherein said orientation of said walls is in a lay-down pattern of 0°/60°/120°.

48. Apparatus for use in tissue engineering according to claim 45 wherein said orientation of said

walls is in a lay-down pattern of 0°/72°/144°/36°/108°.

49. A method for fabricating a customized scaffold structure for use in tissue engineering for an individual patient, said method comprising:

obtaining a digital scan of an anatomical component of the individual patent;

obtaining a desired zone of said digital scan of the anatomical component of the individual patent;

converting said desired zone of said digital scan of the anatomical component of the individual patent to an Fused Deposition Modeling (FDM) system compatible format;

slicing said desired zone of said digital scan of said FDM system compatible format into multiple layers so as to create a sliced model of said customized scaffold structure for fused deposition modeling;

creating tool path data for fused deposition modeling using said sliced model of said customized scaffold structure;

exporting said tool path data of said sliced model of said customized scaffold structure to a Fused Deposition Modeling (FDM) system; and

creating said customized scaffold structure using said tool path data of said sliced model of said customized scaffold structure and said Fused Deposition Modeling (FDM) system.